CLAIMS

What is claimed is:

1. A peptide having the ability to bind pertussis toxin, the peptide being selected from the group consisting of:
RSSHCRHRNCHTITRGNMRIETPNNIRKDA (pp26-5);
RSTMNTNRMDIQRLMTNHVKRDSSPGSIDA (pp26-6);
RSNVIPLNEVWYDTGWDRPHRSRLSIDDDA (pp26-9);
RSWRDTRKLHMRHYFPLAIDSYWDHTLRDA (pp26-15);
SGCVKKDELCARWDLVCCEPLECIYTSELYATCG (G-9);
SGCVKKDELCELAVDECCEPLECFQMGHGFKRCG (G-10);
SGCVKKDELCSQSVPMCCEPLECKWFNENYGICGS (G-15); and,
SGCVKKDELCELAIDECCEPLECTKGDLGFRKCG (G-19).

2. A peptide of claim 1, wherein the peptide is:
RSNVIPLNEVWYDTGWDRPHRSRLSIDDDA (pp26-9); or,
SGCVKKDELCSQSVPMCCEPLECKWFNENYGICGS (G-15).

3. A method for generating a DNA-peptide fusion, said method comprising:

(a) covalently bonding a nucleic acid reverse-transcription primer to an RNA encoding a peptide, said reverse-transcription primer being bound to a peptide acceptor;

(b) translating said RNA to produce the peptide, the peptide being covalently bound to the reverse-transcription primer; and,

(c) reverse transcribing said RNA to produce a DNA-peptide fusion;

wherein the peptide has binding affinity for pertussis toxin.

4. A method for generating a DNA-peptide fusion, said method comprising:

(a) generating an RNA-peptide fusion;

(b) hybridizing a nucleic acid reverse-transcription primer to said fusion;

(c) covalently bonding said primer to said fusion; and

(d) reverse transcribing the RNA of said RNA-peptide fusion to produce a DNA-peptide fusion;

wherein the peptide has binding affinity for pertussis toxin.

5. A method for generating a DNA-peptide fusion comprising the steps of, in combination:

(a) providing an RNA molecule covalently bonded to a peptide acceptor;

(b) covalently bonding a nucleic acid reverse-transcription primer to the molecule of step (a);

(c) translating said RNA molecule to produce a peptide, and

(d) reverse transcribing said RNA molecule to produce a DNA-peptide fusion;

wherein the peptide has binding affinity for pertussis toxin.

6. A DNA-peptide fusion prepared using the method of claim 3, 4 or 5.

7. A peptide having affinity for pertussis toxin identified using the method of claim 3, 4 or 5.

8. A peptide of any one of claims 1, 2 or 7 wherein the peptide is biotinylated.

9. A method for purifying pertussis toxin comprising contacting a biological solution containing pertussis toxin with a peptide of at least one of claims 1, 2 or 7 bound to a solid support to form a pertussis toxin-peptide complex and isolating the complex from other components in the biological solution.

10. The method of claim 9 wherein pertussis toxin is released from the complex and isolated.

11. The method of claim 10 wherein the pertussis toxin is released from the complex by altering the pH of the environment surrounding the complex.

12. The method of claim 11 wheren the complex is exposed to a solution having an acidic pH.

13. The method of claim 11 wheren the complex is exposed to a solution having an basic pH.

14. The method of claim 10 wherein the pertussis toxin is released from the complex by altering the ionic strength of the environment surrounding the complex.

15. The method of claim 14 wherein the ionic strength is altered by exposing the complex to a solution having a high concentration of one or more ionic salts.

16. The method of claim 15 wherein the ionic salt is at least one of sodium chloride or magnesium chloride.

17. The method of claim 16 wherein the ionic salt is magnesium chloride.

18. The method of any one of claims 9-17 wherein said solid support is a bead.

19. The method of any one of claims 9-17 wherein said solid support comprises sepharose.

20. The method of claim 19 wherein the solid support consists of streptavidin sepharose.

21. The method of claim 20 wherein the peptide is biotinylated and the peptide is bound to the solid support through the interaction of the biotin moiety on the peptide and the streptavidin moiety on streptavidin sepharose.

22. A method for isolating a DNA-peptide fusion in which the peptide has binding affinity for pertussis toxin comprising the steps of, in combination:

(a) covalently bonding a nucleic acid reverse-transcription primer to an RNA encoding a peptide, said reverse-transcription primer being bound to a peptide acceptor;

(b) translating the RNA to produce the peptide, the peptide being covalently bound to the reverse-transcription primer; and,

(c) reverse transcribing the RNA to produce a DNA-peptide fusion;

(d) contacting the DNA-peptide fusion with pertussis toxin bound to a solid support to form a DNA-peptide fusion-pertussis toxin complex;

(e) isolating the complex from DNA-peptide fusions that did not complex with pertussis toxin; and,

(f) isolating the DNA-peptide fusion from the DNA-peptide fusion-pertussis toxin complex.

23. A method for identifying a peptide having binding affinity for pertussis toxin comprising carrying out the method of claim 22, and additionally determining the amino acid sequence of the peptide portion of the DNA-peptide fusion.

24. A method for identifying the DNA sequence encoding a peptide having binding affinity for pertussis toxin comprising carrying out the method of claim 22, and additionally determining the nucleotide sequence of the DNA portion of the DNA-peptide fusion.

25. An immunological composition comprising pertussis toxin isolated by the method of claim 10.

26. A peptide having the ability to bind pertussis toxin and the amino acid sequence of a peptide shown in any of Figures 3-14.

27. The method of any one of claims 3-5 or 9-24 wherein the amino acid sequence of the pertussis binding peptide includes amino acid sequences derived from gumarin or PP26.

28. The method of any one of claims 3-5 or 9-24 wherein the nucleotide sequence encoding the pertussis binding peptide includes nucleotide sequences derived from gumarin or PP26.

29. A peptide having the ability to bind pertussis toxin and comprising the amino acid sequence LGHGLGYAY.

30. A peptide of claim 29 further comprising the amino acid sequence ELAVD, ELAID, or ARWDLV.

31. A peptide having the ability to bind pertussis toxin and comprising at least one of the amino acid sequences TTASKS or KWTNEHFGT.

32. A peptide of claim 31 comprising the amino acid sequences TTASKS and KWTNEHFGT.

33. A peptide having the ability to bind pertussis toxin and comprising an amino acid sequence selected from the group consisting of
NVIPLNEVWYDTGWDRPHRSRLSIDD,
VGTTIRIAQDTEHYRNVYHKLSQYSR,
WTSMQGETLWRTDRLATTKTSMSHPP,
LSALRRTERTWNTIHQGHHLEWYPPA,
LSRLARTERTWDRIHQGHHLEWHPPA,
TMNTNRMDIQRLMTNHVKRDSSPGSI,
LSALMRTERTWNTIHQGHHLEWYPPA,
CLATRNGFVMNTDRGTYVKRPTVLQ,
CLATRNGFVQMNTDRGTYVKRPTVLQ,

35. A peptide having the ability to bind pertussis toxin and comprising the amino acid sequence XXAXRXXXXXXNTXXXXXXXXXT or XXAXRXXXXXXNTXXXXXXXXXY, where X is any amino acid.

36. A peptide having the ability to bind pertussis toxin and comprising an amino acid sequence of VXXXXXXXXDTXXXXRXXXXXLS, where X is any amino acid.

37. A peptide of any one of claims 29-36, wherein at least one amino acid is conservatively substituted.

38. A peptide of any one of claims 29-37 wherein the peptide is biotinylated.

39. A method for purifying pertussis toxin comprising contacting a biological solution containing pertussis toxin with a peptide of at least one of claims 29-38 bound to a solid support to form a pertussis toxin-peptide complex and isolating the complex from other components in the biological solution.

40. The method of claim 39 wherein pertussis toxin is released from the complex and isolated.

41. The method of claim 40 wherein the pertussis toxin is released from the complex by altering the pH of the environment surrounding the complex.

42. The method of claim 41 wheren the complex is exposed to a solution having an acidic pH.

43. The method of claim 41 wheren the complex is exposed to a solution having an basic pH.

44. The method of claim 40 wherein the pertussis toxin is released from the complex by altering the ionic strength of the environment surrounding the complex.

45. The method of claim 44 wherein the ionic strength is altered by exposing the complex to a solution having a high concentration of one or more ionic salts.

46. The method of claim 45 wherein the ionic salt is at least one of sodium chloride or magnesium chloride.

47. The method of claim 46 wherein the ionic salt is magnesium chloride.

48. The method of any one of claims 39-47 wherein said solid support is a bead.

49. The method of any one of claims 39-47 wherein said solid support comprises sepharose.

50. The method of claim 49 wherein the solid support consists of streptavidin sepharose.

51. The method of claim 50 wherein the peptide is biotinylated and the peptide is bound to the solid support through the interaction of the biotin moiety on the peptide and the streptavidin moiety on streptavidin sepharose.